Chapter V

Fields, Wells and Rigs of Mari

In its strict~~est~~ sense, petroleum only includes crude oil, but in common usage it includes all liquid, gaseous, and solid (e.g., paraffin) hydrocarbons. Under standard pressure and temperature, lighter hydrocarbons such as methane, ethane, propane and butane occur as gases, while pentane and heavier hydrocarbons are found in the form of liquids or solids. Although there are some important Precambrian and Palaeozoic rocks in Pakistan, the bulk of the country is dominated by the effects of the India-Asia collision. A collision mountain belt comprising the Himalaya, Karakoram and Hindukush Ranges forms its northern part.

Pakistan is endowed with three major Sedimentary Basins which covers 827,000 square kilometres[1], namely the Indus Basin in the east extending into India, the Balochistan Basin on the west extending into Afghanistan & Iran and the Pishin Basin in the north-west which extends into Afghanistan. At the time of independence only 28% of this area was known geologically.[2] The geological setting of Pakistan, in the framework of the modern concept of Plate Tectonics, is rare and matchless in the world. It is in the sense that within an area of about 800000 square kilometres critical tectonic junctions of different interacting plates and micro-plates arc present in a unique environment, where field exposures are excellent and the accessibility is easy.[3]

Balochistan – Parched Civilisation

Balochistan is the most ancient of all civilisation known to man~~kind~~, a civilisation which died because of the scarcity of water. The thousand years old trees in Ziarat, the dried bowls of once alive lakes, the mountains that have outlived their life and now approaching a dusty grave are all evidence that once this land was full of life. Baluchistan's history is linked with Persia and Aryans. Balochistan first emerged in history with the expedition of Semiramis, Queen of Mesopotamia in 900 B.C., she is reported to have invaded India and retreated through the coastline, being able to survive with twenty odd followers. The first detailed description about ancient Balochistan surfaces through the campaigns of Alexander the Great, who in his retreat also adopted the coastal route. His land journey in 325 B.C. took him from the present day Karachi, Bela, Kalat, Makran (Gedrosia) and Gwadar area. The Greeks were constantly harassed by the hostile population~~,~~ and the scarcity of drinking water was so acute that Alexander's troops again mutinied; now for drops of water. In 1838, the British East India Company decided to put a ruler of their favour in Kabul, geography and politics compelled them to follow the Sukkur-Sibi-Bolan-Quetta-Kandahar route. This is the first modern account of present day Balochistan. On the eve of Second Afghan War, a treaty was reached between the British and Khan

[1] Ministry of Petroleum and Natural Resources *Opportunities in Pakistan's upstream Oil and Gas sector*
[2] Geological Bulletin Punjab University, No.18, 1983
[3] Government of Pakistan Ministry of Petroleum and Natural Resources *Stratigraphy of Pakistan* (Geological Survey of Pakistan, Islamabad, 2009). PP-2-30

of Kalat at Mastung in 1876.[4] The Baloch Sardars and Khan of Kalat agreed to accept the mediation of British government in their common disputes rather than the Afghan government. Balochistan thus became the very first political agency in the western frontier to be raised and established by the British, Robert Sandeman became the first agent to governor general (AGG). Khan of Kalat had leased certain territories to British and they formed the agency. Sandeman established his headquarters at Quetta, a distance of 100 miles west of Kalat.[5] British India had entered in a treaty with Iran over the borders in 1871, 1896 and 1905.[6] The initial settlement of frontier of Balochistan with Persia took place in 1871, Major General Fredrick Goldsmid was the main negotiator from the British India ~~side~~, and the line (border) thus is named after him. On independence in 1947, Pakistan inherited almost 590 miles of border (Goldsmid Line) with Iran.[7] An another line, Durand Line was drawn in 1894-95 between Afghanistan and India that demarcated the western frontier of Balochistan with Afghanistan; under the Durand-Rahman Treaty , Afghan ruler ceded certain areas to Balochistan including Pishin.

Balochistan is Pakistan's largest province and geologically it's the oldest, tracing its origin to the ice age. Baloch literary means wanderer. Balochistan covers an area of 347,188 square kilometres (larger than England) with a population of 4.3 million (5.14% of Pakistan's total population). The average population density of 12 persons per kilometre is one of the lowest in the world. The province is mainly barren, rugged, desert, and mountainous. The Annual rainfall is to 2-4 inches and the temperature soars to 55 degree Celsius in summer and down to below zero in winter. In the north, it is bounded by Khyber Pakhtun Khawa (KPK) Province, on the west is Afghanistan and Iran, in the south a coastline of over 470 miles with Arabian Sea and towards east are Sind and Punjab. Balochistan is like a big bowl protected by mountain ranges all around varying from 2000 meters to 4000 meters and only through passes caravans can enter. Province can be divided into three distinct linguistic groups namely Pakhtuns in the North and along Durand Line having a population of 0.8 million with their chief tribes settled in Zhob and Chaman. Brahuis are about 0.9 million and occupy coastline and central area including Kalat, Kharan, Makran and Bela they speak Brahui. The third are the Baloch tribes from which the province derives its name, they are settled along the western mountain ranges of Indus Valley. They claim their descent from Aleppo of Syria[8] and have a population of 0.7 million. The chief tribes are Bugtis and Marris. Some of the Baloch tribes are also settled in Iranian province of Siestan. The Baloch are tall, strong, having long well oiled hair and curly beards. They traditionally and compelled by the extreme hot weather are dressed in long white flowing cotton robes and are excellent riders. For over two centuries they resisted the British and retained their independent way of life. In the absence of agricultural land they live a nomadic life. Tribes of Baluchistan adhere to the tribal bond of honour which is rooted in Hammurabi's Laws. It is a historical coincidence that largest gas reserves in Pakistan were discovered in Baloch tribes territories.

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[4] Issac Bruce ,., *The Forward Policy and its results or thirty Five Years work amongst the tribes on our North Western Frontier of India, first edition 1900.*Quetta: Gosha –e-Adab, 1977

[5]Charles Dilke, *The Baluch and Afghan Frontiers of India, (Littels Living Age American Periodical), May 4th 1889, p- 287.*

[6] Mujtaba ,Razvi, *The Frontiers of Pakistan, a Study of Frontiers Problem in Pakistan Foreign Policy* (Karachi: National Publishing House, 1971)pp,144-145.

[7] *Ibid,p 206*

[8] Gulshan Majeed *National Integration in Pakistan, a Socio-Political analysis of Balochistan* . Ph.D Thesis Punjab University, September 2011. P-58

The term Baloch is a derivate of Belus, the title of Babylonian, followers of Nimrod used to be called ~~as~~ Belusis and in Arab literature they were known as Balos. All this along with the fact that ruins of Mehrgarh in Balochistan further augment the hypothesis that Balochistan, was the cradle of civilization which later perished due to the scarcity of water.[9]

Geology of Balochistan

Geologically, Balochistan is part of Triassic to recent strata with different tectonometallic and sedimentary basins like Baluchistan Basin, Indus Suture, Suleiman and Kirthar Basins.[10] Balochistan is the richest province among all others in terms of minerals, with large proven reserves of gold, indigenous iron, copper, lead, zinc, barite, chromite, coal, gypsum, marble, ochre, silica sand. Almost 58% of Pakistan's coal production comes from this province apart from huge deposits of gypsum in the Suleiman fold belt. On the coast, Makran Mud volcanoes are quite common, they are also found in Pishin –Zhob basin. Petroleum seeps were first reported at Moghul Kot, Khattan, Gokurt and Sanni alongwith bituminious staining in the Sanjwani and Duki.

Balochistan Basin covers an area of 250000 square kilometres and is roughly delineated between Axial Belt of Pakistan to the east and the Lut Block of Iran in the west. The Balochistan Basin is bounded by Afghanistan in the north and Arabian Sea to the south. the evolution of Balochistan Basin is obscure prior to Jurassic.

Mari's Zarghun

Zarghun Gas Field is located 50 kilometres north east of Quetta city. The field is spread over Harnai and Sibi Tehsils; area is the seam of Baluchi and Pashtun tribes. [11] Zarghun itself forms part of Bolan Block. Discovery of hydrocarbons was first made by a British-Kuwait consortium (Premier Kufpec) in 1998. Drilling at the first exploratory well Zarghun South-1, commenced on 4 June 1998. The well reached its target depth of 2094 meters on 8 August 1998. The testing revealed gas in Dunghan /Mughal Kot and Chiltan reservoirs; gas flowed at a maximum rate of 16.7 MMSCF per day. The second well Zarghun South-2 was drilled successfully in 2000.

In 2003, Mari acquired the operatorship of the block through formation of a Bolan Block Joint Venture. The prospects were challenging as it required installations of a processing plant and transportation of gas itself to the tie-in point; involving a distance of 64 Kilometres through rugged, harsh, high mountains. In August 2006, an agreement was signed between Mari and SSGL under which the latter agreed to purchase ~~the~~ gas from Zarghun and it was also agreed upon-to share the cost of pipe laying.[12] President General Pervez Musharraf inaugurated the commencement of development of Zarghun Gas Field on December 8, 2006.

All these plans were put into hold due to miscreants activities in the region and area. In 2009, the cost of the field development project had risen to 40 Million US$, resultantly the entire project looked uneconomical.

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[9] Ibid.

[10] Muhammad Sadiq Malikani, *Stratigraphy, Mineral Potential, Geological history and paleobiography of Balochistan province, Pakistan*. Sindh University Research Journal (Science Series) volume .43(2)269-290(2011)

[11] Mari Annual Report 2014.

[12] https://www.dawn.com/news/207891

It was a blessing in disguise as instead of giving up the entire project, Mari in order to overcome the Gordon Knot undertook development of the field through its own in-house resources. Engineering, procurement, site supervision were thus performed by Mari itself. '**MPCL took this as a challenge, by relaunching the project'**. [13]

Coincidentally the Tight Gas Policy was also announced in 2012 and Zarghun Gas Field qualified for a higher price, thus all of a sudden the economics of the Dunghan reservoir improved dramatically. In 2013, Mari relaunched the project, security was the primary concern and the whole success of the operation relied upon it. Brigadier (retired) Salimullah the resident director of Mari at Quetta played an important role in co-ordinating various strands of security. Frontier Corps Baluchistan deserves special gratitude in this regards along with the 'Gallant' Army Aviation squadron at Khalid Air Base.

Camp establishment and mobilisation of personnel was completed in October 2013 and by the end of February 2014 the civil works were completed, it goes to the credit of entire team that they finished ~~it~~ in time despite ~~a~~ harsh cold weather. Winter is harsh in the area, cold winds blows through the blood veins, heavy snow often cuts off the camp , in such an environment, mechanical construction of pipes; construction works for civil, mechanical and electrical activities were undertaken by Mari. 'varying obstacles were encountered during this stage, attacks from miscreants, adverse weather, delay in shipments.'

26 August 2014, is a historical day in Mari's history when supply of gas from Zarghun to Quetta City was made possible, by supplying gas to ~~the~~ SSGC . For the record it is worth mentioning that the entire project was completed by Mari at an astonishingly low cost of US$23 Million in 2014 as compared to the contractor who had quoted US40 Million in 2009. In September 2016, Zarghun South (ZS) a development well was spud in. ZS-3 is the first ever highly slant well drilled by Mari using its own Rig and expertise. The well reached total depth of 1820 meters on November 20, 2016. [14] The Zarghun Gas Field project is unique in the Pakistan petroleum history, as this is the only gas discovered which is supplied to area locals exclusively. Zarghun is estimated to have gas reserves of 93 BCF. The laying of the pipeline from Zarghun to Quetta City by itself is a great achievement of Mari's human endurance and engineering marvel.

Hanna and Harnai

The **Hanna Block**, consisting of an area of 886.65 square kilometres is located in Balochistan province and lies in prospectivity Zone 1. (Pishin, Ziarat, Loralai, Quetta, Sibi and Kalat Districts).[15] Mari is committed to a minimum financial commitment of US $1.30 million with one optional well up to a depth of 1000 meters or 100 meters into Dungan Formation, whichever is shallower. The **Harnai Block** consists of an area of 2482.67 square kilometres and lies in prospectivity Zone 1. Mari is committed to a firm programme of minimum financial commitment of US$ 6.175 million with a committed exploratory well upto depth of 1500 meters or 100 meters into Chiltan Formation whichever is shallower.

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[13] Ibid.

[14] ttps://mpcl.com.pk/2016/12/29/commencement-of-production-from-development-well-zs-3-in-Zarghun-south-gas-field-bolan- block/. https://fp.brecorder.com/2006/12/20061208505585/

[15] https://www.thenews.com.pk/archive/print/11875-mari-gas-wins-three-exploration-licences

Ziarat Block- Bolan East-1 near Mach City in Kachhi District.

In 2005, Mari entered into its first ever operation outside Daharki with drilling of Ziarat Exploratory Well No.1 MPCL is the operator of Ziarat Exploration License with 60% working interest, while PPL (Europe) is the joint venture partner with 40% working interest. The well was planned into the Chiltan Formation of Jurassic age.

EWT operations started on May 25, 2009. After producing 2285 bbls of crude oil, the well was shut down on June 15, 2009 due to pressure build-up. The work-over operation was conducted with MPCL's own Rig Mari-1 and crew. The rig was mobilized on November 15, 2012. After the successful function testing of the Jet Pump, the Rig was released on January 02, 2013. With coordination and team effort, permanent surface production facilities were installed at the location. EWT operations at **Khost-3** commenced on March 15, 2013. **On 22 May 2018**, Mari and its joint partner made a significant discovery at Macch in Kachhi District (part of Ziarat Block). Well was drilled down to 1,500 meters 'The drill stem tests carried out in Chiltan Formation, which showed a flow of 810 barrels per day (bpd) another drill stem test in Moro/Mughal Kot Formation tested 690 barrels per day of oil'. [16] **It is highlighted that this is the first ever oil discovery in Chiltan and Moro/MughalKot Formations in Balochistan Province**. [17]

Mari in Punjab

Punjab is Pakistan largest province in terms of population and second in terms of area; it is the cultural heart of not only Pakistan but also ~~that~~ of sub-continent. The province derives its name from the Persian; Panj (five) and Ab (water) meaning land of five rivers. Punjab covers an area of 205,344 square kilometres having a population of 110,012,442. At the beginning of empirical history, it was the cities of Taxila, Sialkot and Multan which marked the great seats of trade, government and learning. Lahore emerged at the dawn of last millennium and till to date retains its importance as a seat of culture and commerce; it is the capital of the province. [18]

Harappa archaeological ruins date back to 4500 years and is one of the most important link in the evolution of civilization. It was regarded as the ~~very~~ first city state of Aryans. Buddhist ruins at Taxila not far from Mari's headquarters in Islamabad are regarded as the oldest seat of learning in our world's history; they date back to 500 B.C.[19] Tashkila was the most prosperous satrapy among the twenty odd satrapies paying tribute to Persia. Tashkila was paying in terms of gold whereas others were paying with silver and gold was fifteen times higher than silver; this highlights the prosperity of the city.[20]

In ancient Punjab, mode of transport for the nobility was horse, elephants were the mode of transport for the king and ~~the~~ rajas, footwear was made of white leather with heavy soles to increase the height of the person, white dress made of cotton ~~and~~ wrapped around the lower and upper part

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[16] The Tribune 15 September 2018. https://tribune.com.pk/story/1803665/2-balochistan-mari-petroleum-finds-significant-oil-deposits/

[17] https://mpcl.com.pk/2018/09/27/hydrocarbon-discovery-exploratory-well-bolan-east-1-ziarat-block-balochistan/

[18] John Keay *India a History*, , (Grover Press, New York,2000,)

[19] Cambridge *Encyclopaedia of South Asia* ,1982, pp,22-99. Jawaharlal Nehru *The Discovery of India* (John Day , New York,1945)

[20] Herodotus *The History*, translated by George Rawlinson, ed Manuel Komroff,(Tudor,NewYork,1928)

with a head gear was the standard dress code, due to the hot weather people used to spend part of the hot summer day under the shade of trees. Women and all the other population exhibited high integrity and virtue, locals have been depicted as healthy mainly due to their simple diet and abstinence from wine, doctors specialized in every part of the body and disease, the nuisance and hazard of snakes and scorpions was manifold as they were found under every stone and caused painful bleeding from pores and ultimately death. Yet local doctors with the help of the herbs were able to cure these life-threatening and painful bites, another method of relieving pain was through singing which was performed by natives. Men used to dye their beard in various colours like red, green, white and purple, men also used to wear jewellery, especially earing made of ivory.[21]

Alexander the Great's campaigns in Punjab are the earliest and most detailed military and cultural narrative not only of Punjab but also are a great military heritage. The Battle of Porus is a cultural heritage of Pakistan as the historians have nothing but praise for Porus '*a man of character, he was different from the Persian Darius who fled from the battlefield.. Porus's two sons died in the battle field….he looked majestic after the defeat in his over seven feet tall frame*'[22]. Alexander's soldiers mutinied a few miles ahead of present day Lahore mainly due to high attrition and militant tribes. Alexander ~~later~~ during his retreat was wounded in the citadel of Multan.

Multan was the very first Muslim kingdom in the sub-continent in 712 A.D, it was overrun by Mahmud Ghaznvi at the turn of last millennium, and soon along with Lahore these two cities became the pivot and seat of Muslim governance. In the succeeding years, Slave Dynasty followed by Moghuls retained the importance of these two cities . Multan was important as it controlled the southern routes of trade; Bolan and Baluchistan. Lahore like Multan was the province of ruling dynasties. Mughals built the largest mosque in the world at Lahore apart from many other breath-taking monuments including Shalimar gardens.[23]

It was Maharaja Ranjit Singh who established the very first native empire in Punjab and brought all the cities and towns under Lahore.[24] Two bloody and decisive battles between Sikhs and British resulted in British annexation of Punjab in 1849. They also retained Lahore as provincial capital and soon established some of the best colleges in the sub-continent at Lahore, including the present day Punjab University, Montsorie College, Aitcheson College, Mayo College, to name few. Apart from educational institutions libraries, gardens, museums were also commissioned by the British. Not only British but Sikhs and Hindus also contributed in building colleges and hospitals; Dayal Singh College and Sir Ganga Ram Hospitals are living examples.

Punjab was also the seat of political movement for independence; the Pakistan Resolution was passed in 1940 at Lahore. Punjab suffered the most during the partition of Subcontinent, when Punjab itself was divided on communal lines. In post-independence, army headquarters were established at Rawalpindi, the biggest tank battle after WWII was fought in Chawinda near Sailkot in 1965.

Punjab culturally is an agrarian society; however, it is also the home of mega industrial areas including Faisalabad and Sialkot. The football used in 2018 World Cup was made in Sialkot so was the ball used in 1978 Football World Cup. Punjabi society is based more on caste than tribe, a person

[21] Herodotus *Historia*
[22] Arrian *The Campaigns of Alexander translated by Aubrey de Selincourt* (Penguin,1971),pp,200-280.
[23] Imperial Gazetteer of India, 1904.pp10-30.
[24] Cunigham Joseph Davey *History of the Sikhs*, (London: Oxford, 1918).

is known by the trade he is involved, Intermarriages among castes are a rarity. Punjab also has the largest Christian population in Pakistan. In every Punjabi village, one is bound to see a shrine of some holy person, almost every major city and town has a saint patron, Data Gunj of Lahore, Baba Farid of Pakpattan, Bahauddin Zikriya of Multan, and Imam Barri of Islamabad are some of the most famous saints in the Punjab. It is worth highlighting, that Punjab is also the home of Sikh religion, and as such some of the most holiest places in Sikh religion are also in Punjab, including Panja Sahib at Hasan Abdal, Dera Baba Guru Nanak, Kartarpur in Sialkot and Samadhi of Ranjeet Singh at Lahore. Punjab is also termed as the granary of Pakistan and off sub-continent. Wheat, rice and cotton are main cash crops. The agricultural revolution was brought in late sixties when the Engro Fertlizer plant was commissioned in Ghotki Sindh. The fertilizer increased the average output yield of an acre from 15 maunds to present over forty maunds per acre. The Punjabi culture is thus a fusion of; old and new, rich and poor, liberal as well as orthodox. It is lively as music is an integral part of it. Within Punjabi culture women works in fields, are educated and plays a key role in any fight that erupts in village.

In terms of sedimentary basins, the Punjab Platform is separated from Upper Indus Basin by Sargodha High to the north and Mari Kandhkot High to the south and Sulaiman Fore deep to the west. Proven and potentially viable plays range in age from Infra-Cambrian to Eocene.[25]

Ghauri Block

Ghauri Block was granted to Mari on February 16, 2010, covering an area of 1291.52 square kilometres, falling in Jhelum and Rawalpindi districts of the Punjab Province. The block was considered risky at that time due to presence of seven unsuccessful wells within the block; failure of these wells was presumed due to non-existence of mature source rock in the area. MPCL accepted the challenge and decided to take aggressive exploration activities in the area.

Based on in-house interpretation of 2D seismic data, first exploratory well Ghauri X-1 was spud-in on November 04, 2013 and target depth of 3,990 meters was achieved on March 01, 2014. The drilling and associated operations were completed in a record time of 117 days as against 235 planned days usually required for drilling a deep well in Northern region. MPCL made multiple finds at Exploration Well Ghauri X-1 while undertaking Drill Stem Test in Kussak Sand Stone and Sakesar Limestone. The well was successfully completed in Sakesar Limestone formation.

Production from well Ghauri X-1 was initially through natural flow, however a consistent and rapid decline in production was observed. Artificial lift system was installed at Ghauri X-1 in the form of Jet Pump targeting maximum recovery of in-place crude oil from Sakesar formation. Well was soon on regular production utilizing the hydraulic lift technology.

In April 2019, Mari and its joint venture partner PPL were able to discover oil at Dharain *the well was drilled in December 2017 and reached the depth of 4,770 metres with the objective of testing the hydrocarbon potential of Sakessar and Khewra formations as primary targets. The drill stem tests carried out in Khewra formation showed a flow of 372 barrels per day of crude oil.*[26]

[25] Ministry of Petroleum and Natural Resources *Opportunities in Pakistan's upstream Oil and Gas sector*
[26] https://tribune.com.pk/story/1954865/2-mari-petroleum-finds-oil-reserves-rawalpindi/

Mari in Khyber Pakhtun Khwa

Khyber Pakhtun khwa (KPK) province, a decade ago was known as North Western Frontier Province, a name given when it was separated from Punjab in 1901-02. Khyber Pakhtunkhwa (KPK) is also known as *Ghandhara Civilisation.* The province at present covers an area of over 101.741 square kilometres with a population of over 35,525,047. It stretches from Chitral in the north and follows the watershed of Hindu Kush down to the Waziristan in the south, with Afghanistan on its west, Balochistan in south and Punjab in east.[27] In May 2018, seven tribal areas which were previously under the federal government control have been made part of the province through 26th Amendment In the Constitution of Pakistan.[28]

Traditional oral history of the Pathan, traces their origin , to be one of the lost tribe of Moses for the reason that it gives them a lineage to ~~the~~ Abraham's religion rather than to be termed as anything else.[29] The Pathan tradition highlights that they are one of the early converts of Islam. Historically the early migrations from highlands took place along the water down streams, through the few passes including Khyber, Kurram and Tochi. The tribes either settled at the passes or moved further eastward and settled in the fertile valleys and adopting agriculture as the way of life.[30] Pashtun society is thus based upon tribe way of life, among a dozen tribes only a handful are still migratory in nature including Afridi, Mohmand, Wazir, Mahsud, these tribes have different summer and winter abodes. Other tribes like Khattak and Yousafzai have permanent settlements. Each tribe is divided into clans and sub clans.

KPK was a great seat of learning for the Buddhist religion, it is also home of some of most fiercest battles against Alexander the Great in Swat area. In modern time, neither Mughals, nor Sikhs or British had an easy control over the area. Forward Policy and Great Game made the passes strategically vital for the defence of sub-continent.[31] In our time, Russian invasion of Afghanistan was an extension of the same policy and KPK played a vital, pivotal and decisive role in the war against Russia.[32]

9/11, had a direct impact on KPK, as thousands of Taliban took refuge in the tribal areas, the military actions by the western countries in Afghanistan including indiscriminate aerial bombing further escalated the exodus and fermented a resistance movement against the occupational forces in Kabul. Pashtuns live on both sides of the Pakistan- Afghanistan border (Durand Line). KPK thus suffered the maximum in these two decades of war on terror, both in terms of human lives as well as financially. The Pakistan Army in a prolong campaign with surgical precision and patience cleared the tribal areas from terrorism in such a manner that it also won the heart and minds of the people. At

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[27] *Imperial Gazetteer of India Volume 1, Indian Empire Descriptive*. (Oxford: Clarendon,1907-1909) pp,360-370.

[28] http://www.radio.gov.pk/16-05-2019/enhancement-of-seats-for-merged-tribal-districts-to-pave-way-toward-qadri http://www.na.gov.pk/uploads/documents/1527169356_307.pdf. Constitution of Islamic Republic of Pakistan .

[29] Olaf Caroe, *Pathan 550 B.C.-1957 A.D.*(New York: McMillan1965),p-26

[30] George Curzon , 'Frontiers' The Romanes Lectures , 1907 delivered on 2nd November 1907, *Oxford Lectures on History ,1904-1923, Ten Volumes in One* . Library Press,1924.

[31] Algernon Durand. *Making of a Frontier, five years' experience and adventure in Gilgit, Hunza, Nagar, Chitral and eastern Hindu Kush*. (London: John Murray,1899).

[32] Mohammad Yousaf and Mark Adkin *The Battle for Afghanistan ,the Soviets versus the Mujahedeen during the 1980s* (Yorkshire: Pen and Sword, 2007).

present the province is now healing back into the normal way of life.

Peshawar is the provincial capital and main city, other major cities include Kohat, Nowshehra, Mardan , Bannu, and Chitral. Presently KPK is a blend of conservatism and modernity, some of the finest educational institutions in the country are in Peshawar most notable being the Edwardes College and Islamia College (Peshawar University) along with Khyber Medical College. The biggest arms bazaar in the world was also located close to Peshawar having no less than 14000 shops dealing in arms and ammunition; majority of the arms being handmade. Pathan culture contrary to common perception is liberal, girls are educated, women have an important role within the domestic politics, and it is highly courteous and full of manners; however the spontaneous and instant flaring up of tempers is also part of this culture.

Karak Block

The Karak Block was granted to Mari, as operator with 100 per cent interest owner, on April 14, 2005. Subsequently MOL of Hungary acquired 40 per cent interest share in the block from the MGCL The block is located at the boundaries of Khyber Pakhtunkhwa and Punjab provinces between the districts of Karak and Mianwali. Crude oil discovery in Karak Block was made in the later part of 2011. To further appraise the potential of block, 3D Seismic survey was executed in 2013. Based on the processing and interpretation of 3D data, the location of two exploratory wells Halini Deep-1 and Kalbagh-1 were stacked on the ground.

Halini Deep Well -1

On May 17, 2014. Halini Deep Well -1 was drilled down to a depth of 5,900 meters. After conducting seven Drill Stem Tests in different zones, hydrocarbon discovery was made in Shinawari/ Samanasuk and Hangu /Lumshiwal formations. Installations of surface facilities including laying of 2.8 kilometre crude transportation line from Halini Deep-1 to well Halini X-1 and **installation of discrete separation battery and storage facilities; were completed in a record time of 22 days. Oil production commenced on May 12, 2016** and the well was put on natural production.

Kalabagh

Kalabagh-1A was spudded in on March 20, 2015 in Karak Block with Rig Mari-1 to test the hydrocarbons potential of Sakessar, Lockhart, Hangu and Lumshiwal formations down to the depth of +2,750 meters. Subsequently, Mari decided to deepen the well down to 3,003 meter to evaluate the hydrocarbons potential of Samanasuk and Datta Formations. During testing, the well flowed gas and condensate from Datta and Samanasuk formations, while the testing at Lockhart formation resulted in flow of crude oil. **The construction and installation work for production and processing facilities was completed in March 2017. First gas supply started on June 14,2017.** 5-6 MMSCFD gas from Kalabagh to SNGPL

The Last Frontier; North Waziristan

North Waziristan remained the most turbulent political agency for well over a century and only recently North Waziristan along with six other tribal areas has been brought under the administrative control of Khyber Pakhtunkhwa. Mari Petroleum Company, was awarded the exploration rights in this

region in 2016, when the situation in North Waziristan or in Block Bannu West was precarious and uncertain. Mari as a company believes in accepting challenges, it is a culture and character which has been developed over the last two decades; encouraging bold steps in exploration.

The classic oil exploration is synonymous with frontier and hardship; the rewards are not only monetary but also shapes the destinies of people and generations. North Waziristan covers an area of 6000 square miles with a population of one million; till 1895 the entire area west and south of Bannu was known as Waziristan, British divided it into two political agencies namely North Waziristan and South Waziristan. Geographically the area comprises of mountains, dry river beds, countless water streams known as Tungi. North Waziristan is in fact also known as Tochi Valley, the tribes living within the valley are sub divided into clans and sub clans. From 2005, the security environment in North Waziristan became volatile to an extent that road travelling for non-residents was a matter of life and death, Pakistan Army and the Tochi Scouts were deployed to bring the situation under control and resultantly in 2014 a major operation was launched in the valley to flush out the miscreants; it was a successful operation. On the heel of this success, it was decided by the government of Pakistan to carry out further exploration in the area for oil and gas. Mari is firmly committed to the exploration in the North Waziristan as ' everything we do at Mari is governed by the national interest' and Mari believes that this exploration is a milestone in not only discovering hydrocarbons in the area but also in paving the way for a cultural revolution in the area.

Sindh, Home of Mari

Sindh[33] is the home of Mari Petroleum Company, as the main reserves of the company are in this province. The history of Sindh is in fact the history of civilization in the Subcontinent, the ancient ruins at Mohenjo Dharo highlights the rich cultural heritage of Sindh. the province derives its name from the River Indus.[34] *4500 years ago human development reached a striking peak in the Indus Valley cities of Harappa and Mohenjo Dharo*.[35] The Indus valley is 950 miles long and 700 miles wide, its slope is steep 1:7,000 nearly double of the Egyptian civilization. Apart from Mohenjo Dharo there are several other ancient ruins at Kot Diji known as the Chando Darro[36], Alexander the Great during his retreat along the River Indus faced stiff resistance in Sindh, he camped for several weeks at present day Thatta.[37]

Sindh was known as Hind by the Persians,[38] the province takes its name from the River Sindh, the province is also known as Mehran Valley. Sindh is geographically, culturally and ethnically divided into two halves, Upper Sindh which is home to the Sukkur, Khairpur, Larkana (Mohenjo Dharo) is agriculture based whereas the Lower Sindh including Hyderabad, Thatta and Karachi are commercial centres. Sindh is also known as gateway of Islam to sub-continent, as the very first Islamic invasion took place in this province.

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33 http://www.na.gov.pk/uploads/documents/1550130216_490.pdf. Under the 1973 Constitution the proper name is Sindh and not Sind, as it was used in past

34 Herodotus *The Historia*, translated by George Rawlinson, ed Manuel Komroff, (NewYork: Tudor, 1928), p.182.

35 Cambridge *Encyclopedia of South Asia* ,1982, p-9. John Keay *India a History*, (New York: Grover Press, ,2000) p.32.

36 Ibid p-452-458

37 Arrian *The Campaigns of Alexander* translated by Aubrey de Selincourt (Penguin,1971),p-280

38 http://www.nihcr.edu.pk/

British annexed Sindh in 1842,[39] it was a frustrating act on part of the British, after their humiliating defeat at Kabul. British East India Company had adopted the land route from Sukkur-Sibi-Bolan to enter into Baluchistan thus in order to safeguard the strategic route, ~~the~~ Sindh was made part of the Bombay Province and remained so till 1935 when it was accorded the position of a separate entity.[40] Under the British rule Sindh flourished and entered into modernity, very first police force in sub-continent was raised in 1866 in Sindh. Karachi emerged as the main sea port and later the very first aerodromes were constructed at Drigh Road, and Mauripur. It is worth highlighting that Colonel T.E. Lawrence 'Lawrence of Arabia' served as an airman at Drigh Road base for well over three years. Karachi by 1920s emerged as main link in the trans-continental airways.[41] Sindh also has the distinction of being the very first province to vote for Pakistan in 1947, [42]after independence Karachi became the capital of Pakistan and remained so till 1960 when it was shifted to Islamabad. Karachi is the provincial capital and also the commercial capital of Pakistan, at present it boasts a population of over 20 million people having diversified ethnic background. Mari and its predecessor ESSO both had headquarters at Karachi. Exploration in Sindh started in 1893 at Sukkur.[43] Sindh culturally is Sufi oriented, ownership of land is mostly hereditary, the society is tribal in nature; overall a very serene and mild lifestyle. Apart from the overwhelmingly Muslim population the largest population of Hindus and Parsi in Pakistan reside in Sindh. It is worth highlighting that the very first women head of a modern Islamic state; late Benazir Bhutto hails from Larkana in Sindh.

Sindh is also the heart of Pakistan's fertilizer industry, two of Pakistan's biggest natural gas fields are in District Ghotki (Qadirpur and Mari). Pakistan's biggest fertilizer plant, Engro and another plant of equal magnitude Fauji Fertilizer are also operating in this district.

Sindh province has two major Oil and Gas bearing regions, Sindh Monocline commonly known as Badin Block Area and Outside Sindh Monocline which includes Sukkur Rift Zone, Mazarani Fold Zone, Khirthar Depression and Karachi Depression. Districts including Badin, Tando Muhammed Khan, Hyderabad, Tando Allahyar and Thatta are also part of Badin Block Area.

Sujawal Block

The Sujawal Block consisting of 2,416.43 square kilometres is located in Sind province and lies in prospectivity Zone III. MPCL is committed to a firm work programme of minimum financial commitment of US $ 6.15 million with a committed exploratory well of approximately 3000 meters. The Sujawal Block was awarded to the company as operator with 100 per cent working interest in June 2006. **The company drilled its first exploration well, Sujawal X-1, in 2010, which led to a gas and condensate discovery**. The discovery has since been brought on stream supplying gas to the Sui Southern Gas Company and condensate to the Pakistan Refinery and Pak-Arab Refinery. Gas discovered is of a good heating value of 1045 BTU per cubic feet. The work on Sujjal-1 well, the second exploratory well in Sujawal Block, was taken up on 26 January 2014 and drilled down to a depth of 2535 meters in Lower Goru Formation. As a result of testing, the well flowed gas and condensate at a rate of 13.1 MMCFD (million cubic feet per day) and 75 barrels per day (BPD), 'We have been blessed with a significant gas and condensate discovery in Sujawal Block's Sujjal-1

39 Imperial Gazetteer of India, 1904

40 Government of India Act 1935.

41 https://sindh.gov.pk/dpt/History%20of%20Sindh/history.htm

42 Fatima Riffat, Iqbal Chawla, Adnan Tariq *History of Sindh from a regional perspective, Sindh and Making of Pakistan* . (Lahore:Punjab University,2016),160.

43 https://www.dawn.com/news/1479814/a-brief-history-of-exploration

well,'.[44] **This discovery is significant because it is the first hydrocarbon discovery in Lower Goru Upper C-Sand in the southernmost part of the country**

Aqeeq-1 exploratory well was spud-in on March 9, 2017 and drilled down to 2,320 metres to test hydrocarbon potential of the Upper Sands of Lower Goru Formation. During testing in Upper Sands, the well flowed 5 MMSCFD gas and 21 barrels per day condensate with wellhead flowing pressure of 586 Psi at 40/64 inch choke size.

Rigs of Mari

The drilling rigs are the working bulls of the E&P industry, the drilling rigs are the very essence and soul of oil exploration, ranging from towering massive structures to smaller ones; these structures drilled deep into the earth crust and recover valuable hydrocarbons. Mari inherited 'Sky Top Rig' from ESSO in 1984, the rig was bought in the late fifties.

Rig operators lead a rigorous life, working at the drilling site round the clock. Rigs move extensively and operate as a single unit and entity; where everyone precisely knows his task and duty. There is no proper institute for training Rig operators in Pakistan and majority of experienced operators working at Mari today have gotten their prior experience while working in the Gulf. With the induction of two new rigs, it was necessary for MPCL to have experienced and professional crews to operate these rigs.

At the drilling site, a well-established camp is setup in which the working, living and drilling areas are clearly marked and outlined. The supervision of the drilling rig is the responsibility of the Tool Pusher, an operator who wears a blue uniform, and ensures the safe and smooth conduct of the drilling rig. The Company Man wears a khaki uniform and is responsible for everything else apart from the work of the Tool Pusher. Apart from these two men, a representative of HSE is also present on site to ensure that all safety parameters and requirement are strictly adhered to. In order to deal with medical emergencies the presence of a doctor and ambulance is also available on site.

Contrary to popular perception, only a handful men are required to operate a rig, as they work in shifts approximately thirty odd men are sufficient for operating a rig around the clock. Work starts with the dismantling of the rig from one point and its transportation to another; Mari Rig 3, requires a truck load of approximately 90 units for transportation. This phase is accomplished with precision and requires experience.

The exploration and drilling of hydrocarbons involves studying the structure of the earth's crust. To spud a well requires months of meticulous hard work and planning. The present theories on hydrocarbons revolves around the hypothesis that, first and foremost a source rock has to be identified in which the fossils have been buried over the centuries and millenniums known as Palaeozoic Era; this source rock should be buried deep enough to allow the earth temperature and pressure to heat the

[44] *Dawn* 13th May 2014

fossils. Next to the source rock, porous rock formations having good permeability must be present so that it allows for a free flow of hydrocarbons; a Cap Rock is also essential as it seals or traps the hydrocarbons thus capping them inside the crust. In Mari, all this work is done by the Exploration Department.

The next step is to analyse the geologists' hypothesis by carrying out seismic survey, thereby probing deep into the suspected rock area. There are methods including Vibrosis, in which the vibrations are created and then their effects are analysed. Dynamite is another method in which the dynamite is use deep inside the crust to create ripples and then analyse it. Mari Services Department was raised in 2014 to carry out all such ventures at its own, thus bringing flexibility and economy to the company. In many of the annual board meetings it was highlighted that due to non-availability of such services the company has suffered losses, basing upon this, the MSD was raised. After the completion of this phase, the decision to conduct the physical drilling to validate the hypothesis is reached. Once, it has been decided drilling will be done, the intricate business of moving the rigs and other equipment is set into motion.

Acquisition of land is another delicate matter in which more than anything the social culture plays a key role. As long as Mari was operating in the Daharki, the acquisition was streamlined due to the continuous presence and drilling activities of Mari Gas Company Limited and its predecessor ESSO. In the Mari Gas Field, initially an acquisition of eight acres was made for each well which has now been reduced to five acres. The owner is given a compensation for his land which is much higher than the market price and more importantly he is paid to protect the well as well. This system known as Chowkidar (watchman) is hereditary in nature, In Punjab, acquisition of land requires a more patient approach and the director lands (DM Lands) is required to undertake many sojourns and attends lengthy meetings not only with the owner but with his entire extended family at their residences. As soon as the general public realise that sooner or later an exploration will be conducted, they get into litigation amongst each other so that they can fetch the highest possible price for their land. Before any deal is reached the land records have to be verified and looked into. This process is long and tedious but is resolved in an amicable and peaceful manner.

Establishing of the well and camp from scratch, requires clearing the area, it is cleared for establishing the basic essential amenities. One of the fundamental area that are taken into consideration involves safety as the first and paramount factor. The very nature of the well, whether it is wildcat, appraisal, exploratory or deep plays significant role in the overall development of the well.

Before the rig is moved, the administrative and safety parameters must be met. A camp with a rig is a high end camp, having its own doctor, ambulance, geologist, water supply, power, road, communication and now internet access. The living and catering is on contract. In the past it was in canvas, at present it is in air conditioned containers with attached washrooms. Two types of messes are established in the camp, one for seniors and another for juniors, there is no difference as far as the menu is concerned, it is only to allow greater freedom of relaxation to the juniors. Discipline in a camp is very rigorous and very rightly so as the job itself is highly inflammable and a minor lapse of concentration can have disastrous consequences results.

The drilling site is divided into two sections, one under the supervision of the Company Man and the other under the supervision of the Tool Pusher, with a representative of health-safety-environment (HSE). All the work especially the initial setting up and later day to day operations are monitored by HSE. Safety overlook isn't an integral part of our day to day life or culture in Pakistan, thus ensuring

that everyone is wearing protective gear, identification of health hazards and ensuring that the highest safety standards are adhered is difficult and tedious task . At present, all fields are monitored in the head office through cameras for safety parameters.

Mari purchased its first Rig in 2007 when it signed a contract with Honghua Petroleum Equipment Company at their headquarters at Chengdu. It was delivered in Pakistan in March 2008. It is a 1500 horsepower rig which can drill down to 5000 meters. Another Rig Mari II was purchased and inducted in 2013, it was bought from same company but has more horsepower and can drill deeper than the two other rigs.